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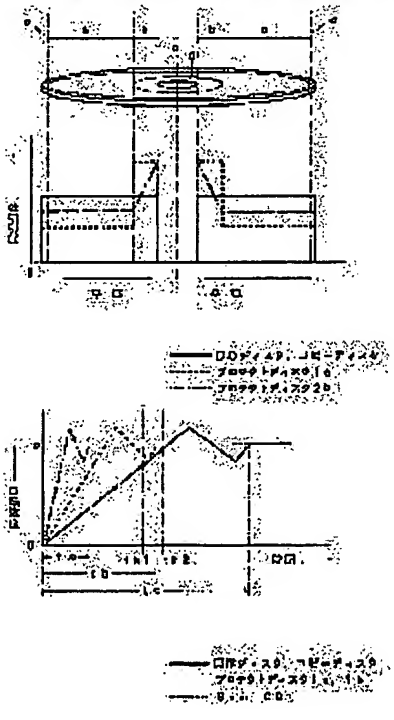
(71)Applicant : **VICTOR CO OF JAPAN LTD**

(72)Inventor : **OZAKI KAZUHISA**

(54) OPTICAL DISK AND ITS CHECK DEVICE



(57)Abstract:

PURPOSE: To provide an optical disk and its disk device suitable for determining whether a disk is normal or not by utilizing the fact that the rising time of a rotational speed differs depending on the volume density of a disk.

CONSTITUTION: A rising time up to a disk rotational speed (e) is measured by a timer. When the rising time is a threshold value th2 or higher, this is a standard disk [CD of a diameter 12cm(CD-DA), CD-ROM] in which the volume density of a data area (a) and that of a data area (b) are the same and this is determined to be at least an illegal copy disk illegally copied. When the rising time is smaller than the threshold value th1, an optical disk 1 and protect disks 1a and 1b having the same total weight and radius as the standard disk and the volume density of the data area (a) smaller than that of the non-data area (b) are determined to be normal disks.

LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] The optical disk characterized by having the volume density of the data area which has the same AUW and the same radius as a standard disk with same volume density of a data area and volume density of a non-data area, and was made into smallness from the volume density of a non-data area.
[Claim 2] The rise time to the predetermined value of disk rotational speed is measured. the rise time size when becoming Are a standard disk with same volume density of a data area and volume density of a non-data area, or it judges that the 1st disk which obtained by carrying out an unjust copy is an inaccurate copy disk. the rise time -- smallness -- to a case Check equipment of the optical disk characterized by having a judgment means to judge that the 2nd disk equipped with the volume density of the data area which has the same AUW and the same radius as the aforementioned standard disk, and was made into smallness from the volume density of a non-data area is a regular disk at least.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the optical disk which prevented the illegal copy by CD-ROM on which information, such as for example, TV game, was recorded, and its check equipment.

[0002]

[Description of the Prior Art] When music, a picture, a character, data, etc. are expressed as a digital information signal and the information is copied as compared with the case where they are expressed as an analog signal (duplicate), there is no degradation of transmission characteristic top information. For this reason, it has been a big problem on the present copyright, and it forbids copying a digital information signal in a form as it is, or restricting is called for.

[0003] For example, CD-ROM etc. is manufactured based on the specification exhibited ["ISO /9660"]. When performing copy prevention based on this specification, the code for copy prevention will be beforehand recorded on the disk. And if there is this sign, it will be a regular disk, if there is no sign, it will be judged as an inaccurate copy disk, and it lectures on the disposal of stopping the reproduction. What will be produced commercially CD-ROM produced commercially now and from now on is considered that the thing in accordance with this specification becomes in use.

[0004] However, if a copy machine which copies the record data of a disk the whole round head is used by the technique of such copy prevention, manufacture of the copy disk simply received as a regular disk is possible. For this reason, the weak disk of copy prevention will appear on the market, and infestation of an unjust copy will be caused.

[0005] Then, the specification of the aforementioned disk and different original specification are built, and if soft, the technique to which the copy protection which reads CD-ROMs, such as usual "ISO9660" etc., and prevent from reading is applied can be considered. However, though such technique is used, data are read in a disk in a physical frame unit, and any disks will be copied if the copy machine copied to CD-WO (write-once disk) etc. is used.

[0006] By the way, as a copy prevention measure by present, there is a thing of writing a copy code in a soft target (logical) like SCMS (serial copy management system) hard-wise in VTR, DAT, etc. There is a thing using the pit (pseudo-pit) smaller than usual as a copy prevention measure which writes in the copy code in hard as a copy code (for example, JP,61-178732,A). Moreover, there are some which write the code for copy prevention as a copy prevention measure which writes in the copy code in soft based on a specific format.

[0007]

[Problem(s) to be Solved by the Invention] however, the software with which CD-ROM in which the copy code was written in soft reads the usual CD-ROM in the case of the copy prevention measure which writes in the copy code in soft -- if -- it could not be read, either and data read per frame of a lower level etc. more, and when using the copy machine copied to CD-WO etc., the problem to which it will be lost and any disks will be copied had the effect of copy prevention

[0008] While this invention offers an optical disk equipped with the volume density of the data area which has the same AUW as AUW and the same radius of a standard disk, and was made into smallness from the volume density of a non-data area as a regular disk for illegal copy prevention Using the difference of the rise time of the rotational speed of the disk by the difference in the volume density of these two fields, even if an appearance configuration is the same as that of a standard disk, it aims at offering the check equipment of the optical disk which checks an inaccurate copy disk.
[0009]
[Means for Solving the Problem] this invention offers the optical disk which becomes the composition of the following (1) and (2), and its check equipment in order to solve the above-mentioned technical problem.
[0010] (1) The optical disk 1 (protection disks 1a and 1b) characterized by having the volume density of data area a which has the same AUW and the same radius as a standard disk (CD (CD-DA), CD-ROM whose diameter is 12cm) with same volume density of data area a and volume density of non-data area b, and was made into smallness from the volume density of non-data area b.
[0011] (2) the rise time to the predetermined value (rotational speed e) of disk rotational speed -- measurement (with timer) -- carrying out -- the rise time -- size -- a case (a threshold th2 -- size -- a case) a standard disk (CD (CD-DA) whose diameter is 12cm --) with same volume density of data area a and volume density of non-data area b it is CD-ROM or is an inaccurate copy disk about the 1st disk which obtained by carrying out an unjust copy -- judging -- the rise time -- smallness -- to a case (a threshold th1 -- smallness -- a case) The same AUW and the same radius as a standard disk Having had a judgment means (control circuit) 2 to judge that the 2nd disk (an optical disk 1, protection disks 1a and 1b) equipped with the volume density of data area a which has and was made into smallness from the volume density of non-data area b is a regular disk at least The check equipments A and B of the optical disk by which it is characterized.
[0012]
[Function] Since the optical disk of this invention is equipped with the volume density of the data area which has the same AUW and the same radius as a standard disk with same volume density of a data area and volume density of a non-data area, and was made into smallness from the volume density of a non-data area Since the rise time of rotational speed serves as [the direction of an inaccurate copy disk] smallness even if the same as that of a disk with a regular appearance configuration, when the rise time of the rotational speed of the disk by the difference in the volume density of these two fields is compared, It can judge that it is a regular disk by distinguishing the difference in this rise time.
[0013]
[Example] Hereafter, the optical disk and its check equipment of this invention are explained along with drawing 1 - drawing 5 . Drawing in which drawing in which drawing 1 shows the volume density property of the optical disk of this invention, drawing 2 , and drawing 3 show the 1st of the check equipment of the optical disk of this invention and the 2nd example block diagram, and drawing 4 shows the start property of the rotational speed of a disk, and drawing 5 are the flow charts explaining operation of the check equipment of the optical disk of this invention.
[0014] While having the same appearance configuration and same AUW as a profile (CD-DA, CD-ROM, etc. are hereafter described as a "standard disk"), for example, CD

whose diameter is 12cm so that it may mention later, when the inner circumference side is heavier than a periphery side and rotates this, since moment of inertia (inertia) is small, the optical disk of this invention has the start of rotational speed quicker than standard CD disk.

[0015] (Example 1) As the optical disk 1 of a correspondence this invention is shown in invention according to claim 1 at drawing 1 (A), an appearance configuration and AUW are the same as that of a standard disk, and consist of non-data area b which is data area a and the inner circumference portion which are the periphery portion, an outermost periphery field c, and a pin center,large hole d. o is the medial axis of an optical disk 1.

[0016] Data area a begins TOC in the most-inner-circumference side, and a lot of various data are spiral as a center, or the field currently recorded in the shape of a concentric circle about a medial axis o as many pit trains. Non-data area b is a field where data are not recorded at all.

[0017] The optical disk 1 of composition of having described above has the same AUW and the same radius as a standard disk with same volume density of data area a and volume density of non-data area b, and is equipped with the volume density of data area a made into smallness from the volume density of non-data area b.

[0018] Now, an appearance configuration and the AUW of the inaccurate copy disk which copied unjustly the optical disk 1 which is a regular disk are completely the same as that of a standard disk (it is difficult to distinguish both visually). Moreover, the inaccurate copy disk has copied inaccurate data to CD-MO with same standard disk, appearance configuration, and AUW. For this reason, an inaccurate copy disk becomes what has the same volume density of data area a and the same volume density of non-data area b like a standard disk (volume density property of the solid line shown in drawing 1 (B)). On the other hand, to the radius, the optical disk 1 which is a regular disk does not have fixed volume density, and is equipped with the volume density of data area a made into smallness from the volume density of non-data area b.

[0019] The volume density in the data area a of protection disk 1a for copy preventive measures which is an example of the optical disk 1 which is a detailed regular disk is fixed to radial, it is smallness, and the volume density in the non-data area b is more fixed than the volume density of the standard disc data field a to radial, and it is size from the volume density of non-data area b of a standard disk (volume density property of the dashed line shown in drawing 1 (B)). Moreover, protection disk 1b of the volume density in the data area a which is another example of an optical disk 1 is fixed to radial, and size from the volume density in data area [of protection disk 1a described above from the volume density of the standard disc data field a although it was smallness] a. Moreover, it goes up in the shape of a straight line, and the volume density in the most inner circumference serves as the maximum as the volume density in the non-data area b goes to an inner circumference side from a periphery side (the volume density of the outermost periphery of non-data area b is smallness from it of a standard disk). And although it is size, the volume density of the most inner circumference of non-data area b is the same as that of it of protection disk 1a which is smallness and was described above rather than that of a standard disk than that of said protection disk 1a (volume density property of the alternate long and short dash line shown in drawing 1 (B)).

[0020] The addition area which was shown in drawing 1 (B) and which applied the area (namely, volume density x radius distance) of data area a and the area of non-data area b

in each volume density property of a standard disk, a copy disk, and the PUROTO disks 1a and 1b corresponds to the AUW of a disk (except for the outermost periphery field c). and each addition area of these standard disk and the protection disks 1a and 1b -- abbreviation -- the same (namely, AUW of a disk) Here, there is specification of IEC908 (the so-called Red Book specification) or JISX6281 grade in a standard disk, and the AUW of a disk is specified in this specification. Of course, if it is this contractor, it can perform easily processing it so that it may consider as the volume density property which described above the AUW of the above-mentioned optical disk 1 containing the protection disks 1a and 1b based on the AUW of a standard disk.

[0021] As mentioned above, the volume density of non-data area b is size as compared with the volume density of the data area a, and the moment of inertia of the optical disk 1 containing the protection disks 1a and 1b which the weight is concentrating on inner circumference is smallness from the moment of inertia of the standard disk which each volume density of data area a and non-data area b is the same, and the weight is not concentrating on inner circumference. By transposing the difference in this moment of inertia to the difference in the rise time of disk rotational speed, the check equipments A and B explained below perform the judgment (check) with a regular disk and an inaccurate copy disk.

[0022] (Example 2) The check equipment A of the optical disk of this invention which performs the check of correspondence now the optical disk 1 which is a regular disk, and an inaccurate copy disk to invention according to claim 2 is an object for disks dealing with a constant linear velocity (CLV), and as shown in drawing 2 , it consists of a control circuit 2, the RF digital disposal circuit 3, RF amplifier 4, an optical pickup 5, a constant linear velocity (CLV) servo processing circuit 6, a motor driver 7, and a spindle motor 8. The inside of drawing and AA are an inspected disk. The control circuit 2 was equipped with the timer which consisted of software, and the RF digital disposal circuit 3 is equipped with PLL3A.

[0023] Operation of the check equipment A of the optical disk of composition of having described above is explained. Namely, if the inspected disk AA of CLV is set on the turntable which check equipment A does not illustrate as shown in drawing 5 , the control circuit 2 which controls operation of the whole equipment and which is a microprocessor, for example will detect this, and will once change the timer of viscus into a clearance (reset) state (100,110). Then, while a control circuit 2 sends out a disk rotation start control signal to the CLV servo processing circuit 6 according to a user choosing check operation (play operation), a timer is changed into a start state. The CLV servo processing circuit 6 sends out the motorised signal for carrying out the rotation drive of the spindle motor 8 of a rotation idle state according to this to the motor driver 7, if a disk rotation start control signal is received. The motor driver 7 supplies the driving signal which amplified this motorised signal to a spindle motor 8.

[0024] The CLV servo processing circuit 6 detects the rotation operating state of a spindle motor 8 as follows. That is, TOC of the inspected disk AA set on the turntable rotated by the spindle motor 8 is traced by the optical pickup 5, and RF signal which this acquired is supplied to PLL circuit 3A which constitutes the RF digital disposal circuit 3 through RF amplifier 4. If the frequency of RF signal supplied from RF amplifier 4 becomes the same as that of the predetermined oscillation frequency of PLL circuit 3A and PLL circuit 3A will be in a lock state, a frequency lock signal will be outputted to the

CLV servo processing circuit 6 and a control circuit 2 from PLL circuit 3A. The timer of a control circuit 2 stops a count at the time when the frequency lock signal supplied from PLL circuit 3A was supplied (it is a time of rotation of a spindle motor 8 reaching the rotational speed e shown in drawing 4 which this state mentions later).
[0025] In this way, if a spindle motor 8 raises a rotational frequency gradually from a rotation idle state and results in predetermined rotational speed, the CLV servo processing circuit 6 will lock rotation of a spindle motor 8, and it will continue (120,130) outputting a fixed motorised signal to the motor driver 7 so that the inspected disk AA may always be rotated in the state of CLV. If the predetermined CLV state of a spindle motor 8 is detected, temporary memory of the control circuit 2 will be carried out to the memory which does not illustrate the counted value of the timer at that time (140). the memory which is not illustrated -- ** -- the counted value (** value) th1 for distinguishing CD with a diameter of 8cm which are the optical disk 1 which is a regular disk, and a regular disk, and ** -- memory of the counted value (** value) th2 for distinguishing the optical disk 1 and standard disk (an inaccurate copy disk being included) which are a regular disk is carried out beforehand
[0026] A control circuit 2 reads the counted value according to ** value th 2, and the counted value of the inspected disk AA from memory, and the counted value of the inspected disk AA compares whether it is size from ** value th 2 (150). Consequently, if it is not size, the counted value of the inspected disk AA compares whether it is smallness from ** value th 1 (160). Consequently, if it is not smallness, it will be distinguished from the optical disk 1 which is a regular disk (170). On the other hand, the counted value of the inspected disk AA is distinguished from ** value th 1 with 8cmCD as it is smallness (180).
[0027] On the other hand, as for a control circuit 2, the counted value of the inspected disk AA distinguishes whether it is it that it is size from ** value th 2 a digital audio disc (CD-DA) of the standard disks further (150,190). Consequently, it is reproduced in digital audio mode that it is CD-DA (200). On the other hand, the disk concerned is discharged after being judged [be / CD-ROM (CD-MO) which is an inaccurate copy disk / it] with an inaccurate copy disk (210,220).
[0028] In this way, the check equipment A of the optical disk of composition of having described above can be discharged out of equipment, without reproducing this, when the inspected disk AA can be distinguished on 8cmCD, a regular disk (optical disk 1), CD-DA, or an inaccurate copy disk and is distinguished from an inaccurate copy disk.
[0029] By the way, the ** values th1 and th2 mentioned above are set up as follows. That is, its attention is paid to the difference of the rise time of the rotational speed of a disk until it reaches the fixed rotational speed (for example, CLV state) e when setting the inspected disk AA in the above-mentioned check equipment A, and rotating it as shown in drawing 4 . The rotational speed of a disk expresses time until a CLV servo locks in the rotational speed which can read TOC of the most inner circumference of the disc data field a. Since the moment of inertia of the disk which carried out the usual unjust copy is size from it of the optical disk 1 which is a regular disk, the rotation rise time is Time tc. On the other hand, since the moment of inertia of an optical disk 1 is smallness from it, the rotation rise time is Time tb (tb<tc). Moreover, since it is moment-of-inertia smallness, the rotation rise time turns into Time ta from which thing of CD usual in

8cmCD, the disk (CD-ROM, CD-MO) which carried out the unjust copy, and an optical disk 1 (ta<tb<tc).
[0030] Then, ** value th 2 is the time set up so that (CD-ROM, CD-DA) (a regular disk, 8cmCD) could be distinguished. Above-mentioned ** value th 2 is the value (time) set up so that (CD-ROM, CD-DA) could be classified as it is more than this. Moreover, above-mentioned ** value th 1 is the value (time) set up so that (a regular disk and 8cmCD) could be classified as it is less than [this].
[0031] (Example 3) The check equipment B of the optical disk of this invention which performs the check of correspondence now the optical disk 1 which is a regular disk, and an inaccurate copy disk to invention according to claim 2 is an object for disks dealing with a constant angular velocity (CAV), and as shown in drawing 3 , it consists of a control circuit 2, an optical pickup 5, the motor driver 7, a spindle motor 8, FG amplifier 9, and a FG servo processing circuit 10. The same component as what was mentioned above attaches the same sign, and omits the explanation.
[0032] Operation of the check equipment B of the optical disk of composition of having described above is explained. That is, if the inspected disk AB of CAV is set on the turntable which check equipment A does not illustrate as shown in drawing 5 , a control circuit 2 will detect this and will once carry out the clearance (reset) state of the timer of internal organs (100,110). Then, while a control circuit 2 sends out a disk rotation start control signal to FG servo processing circuit 10 according to a user choosing check (play) operation, a timer is changed into a start state. FG servo processing circuit 10 sends out the motorised signal for carrying out the rotation drive of the spindle motor 8 of a rotation idle state according to this to the motor driver 7, if a disk rotation start control signal is received. The motor driver 7 supplies the driving signal which amplified this motorised signal to a spindle motor 8.
[0033] FG which does not illustrate the rotational frequency of a spindle motor 8 detects FG servo processing circuit 10, the predetermined rotational frequency signal (namely, rotational frequency signal corresponding to rotational speed e) by which memory was carried out to the rotational frequency signal inputted through the FG amplifier 9 is compared, and the time when both differential signal is no longer outputted is judged to be the predetermined CAV state of a spindle motor 8.
[0034] In this way, if a spindle motor 8 raises a rotational frequency gradually from a rotation idle state and results in predetermined rotational speed, FG servo processing circuit 10 will lock rotation of a spindle motor 8, and it will continue (120,130) outputting a fixed motorised signal to the motor driver 7 so that the inspected disk AB may always be rotated in the state of CAV. If the predetermined CAV state of a spindle motor 8 is detected, temporary memory of the control circuit 2 will be carried out to the memory which does not illustrate the counted value of the timer at that time (140). the memory which is not illustrated -- ** -- the counted value (** value) th1 for distinguishing CD with a diameter of 8cm which are the optical disk 1 which is a regular disk, and a regular disk, and ** -- memory of the counted value (** value) th2 for distinguishing the optical disk 1 and standard disk (an inaccurate copy disk being included) which are a regular disk is carried out beforehand
[0035] A control circuit 2 reads the counted value according to ** value th 2, and the counted value of the inspected disk AB from memory, and the counted value of the inspected disk AB compares whether it is size from ** value th 2 (150). Consequently, if

it is not size, the counted value of the inspected disk AB compares whether it is smallness from ** value th 1 (160). Consequently, if it is not smallness, it will be distinguished from the optical disk 1 which is a regular disk (170). On the other hand, the counted value of the inspected disk AB is distinguished from ** value th 1 with 8cmCD as it is smallness (180).

[0036] On the other hand, as for a control circuit 2, the counted value of the inspected disk AB distinguishes whether it is it that it is size from ** value th 2 a digital audio disc (CD-DA) of the standard disks further (150,190). Consequently, it is reproduced in digital audio mode that it is CD-DA (200). On the other hand, the disk concerned is discharged after being judged [be / CD-ROM (CD-MO) which is an inaccurate copy disk / it] with an inaccurate copy disk (210,220).

[0037] In this way, the check equipment B of the optical disk of composition of having described above can be discharged out of equipment, without reproducing this, when the inspected disk AB can be distinguished on 8cmCD, a regular disk (optical disk 1), CD-DA, or an inaccurate copy disk and is distinguished from an inaccurate copy disk.

[0038] Although the check equipments A and B mentioned above were explained as an isolated system on account of explanation here, it cannot be overemphasized that it can constitute even if it adds the composition of such check equipments A and B to the preceding paragraph of the reversion system of a general optical disk player or shares a part of composition of a reversion system.

[0039]

[Effect of the Invention] Since the optical disk of this invention is equipped with the volume density of the data area which has the same AUW and the same radius as a standard disk with same volume density of a data area and volume density of a non-data area, and was made into smallness from the volume density of a non-data area Since the rise time serves as [the direction of this optical disk as a disk more regular than an inaccurate copy disk] smallness when the rise time of the rotational speed of a disk is compared, even if it is the case where both cannot be distinguished from an appearance configuration and a weight side, The judgment of being a regular disk can be easily ensured by distinguishing this difference. Moreover, the check equipment of the optical disk of this invention can be discharged out of equipment, without facing distinguishing a regular disk and an inaccurate copy disk, being able to carry out comparison distinction of the difference of the rise time of the rotational speed of a disk, being able to check an inaccurate copy disk certainly easily, and playing only an inaccurate copy disk, when it is as a result of [with an inaccurate copy disk] distinction.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] this invention relates to the optical disk which prevented the illegal copy by CD-ROM on which information, such as for example, TV game, was recorded, and its check equipment.

PRIOR ART

[Description of the Prior Art] When music, a picture, a character, data, etc. are expressed as a digital information signal and the information is copied as compared with the case where they are expressed as an analog signal (duplicate), there is no degradation of transmission characteristic top information. For this reason, it has been a big problem on the present copyright, and it forbids copying a digital information signal in a form as it is, or restricting is called for.

[0003] For example, CD-ROM etc. is manufactured based on the specification exhibited ["ISO /9660"]. When performing copy prevention based on this specification, the code for copy prevention will be beforehand recorded on the disk. And if there is this sign, it will be a regular disk, if there is no sign, it will be judged as an inaccurate copy disk, and it lectures on the disposal of stopping the reproduction. What will be produced commercially CD-ROM produced commercially now and from now on is considered that the thing in accordance with this specification becomes in use.

[0004] However, if a copy machine which copies the record data of a disk the whole round head is used by the technique of such copy prevention, manufacture of the copy disk simply received as a regular disk is possible. For this reason, the weak disk of copy prevention will appear on the market, and infestation of an unjust copy will be caused.

[0005] Then, the specification of the aforementioned disk and different original specification are built, and if soft, the technique to which the copy protection which reads CD-ROMs, such as usual "ISO9660" etc., and prevent from reading is applied can be considered. However, though such technique is used, data are read in a disk in a physical frame unit, and any disks will be copied if the copy machine copied to CD-WO (write-once disk) etc. is used.

[0006] By the way, as a copy prevention measure by present, there is a thing of writing a copy code in a soft target (logical) like SCMS (serial copy management system) hard-wise in VTR, DAT, etc. There is a thing using the pit (pseudo-pit) smaller than usual as a copy prevention measure which writes in the copy code in hard as a copy code (for example, JP,61-178732,A). Moreover, there are some which write the code for copy prevention as a copy prevention measure which writes in the copy code in soft based on a specific format.

EFFECT OF THE INVENTION

[Effect of the Invention] Since the rise time serves as [the direction of this optical disk as a disk more regular than an inaccurate copy disk] smallness when the rise time of the rotational speed of a disk is compared, even if the optical disk of this invention was the case where both could not be distinguished from an appearance configuration and a weight side, since it had the volume density of the data area which has the same AUW and the same radius as a standard disk with same volume density of a data area and volume density of a non-data area, and was made into smallness from the volume density of an The judgment of being a regular disk can be easily ensured by distinguishing this difference. Moreover, the check equipment of the optical disk of this invention can be discharged out of equipment, without facing distinguishing a regular disk and an inaccurate copy disk, being able to carry out comparison distinction of the difference of the rise time of the rotational speed of a disk, being able to check an inaccurate copy disk certainly easily, and playing only an inaccurate copy disk, when it is as a result of [with an inaccurate copy disk] distinction.

EFFECT OF THE INVENTION

[Effect of the Invention] Since the rise time serves as [the direction of this optical disk as a disk more regular than an inaccurate copy disk] smallness when the rise time of the rotational speed of a disk is compared, even if the optical disk of this invention was the case where both could not be distinguished from an appearance configuration and a weight side, since it had the volume density of the data area which has the same AUW and the same radius as a standard disk with same volume density of a data area and volume density of a non-data area, and was made into smallness from the volume density of an The judgment of being a regular disk can be easily ensured by distinguishing this difference. Moreover, the check equipment of the optical disk of this invention can be discharged out of equipment, without facing distinguishing a regular disk and an inaccurate copy disk, being able to carry out comparison distinction of the difference of the rise time of the rotational speed of a disk, being able to check an inaccurate copy disk certainly easily, and playing only an inaccurate copy disk, when it is as a result of [with an inaccurate copy disk] distinction.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, the software with which CD-ROM in which the copy code was written in soft reads the usual CD-ROM in the case of the copy prevention measure which writes in the copy code in soft -- if -- it could not be read, either and data read per frame of a lower level etc. more, and when using the copy machine copied to CD-WO etc., the problem to which it will be lost and any disks will be copied had the effect of copy prevention

[0008] While this invention offers an optical disk equipped with the volume density of the data area which has the same AUW as AUW and the same radius of a standard disk, and was made into smallness from the volume density of a non-data area as a regular disk for illegal copy prevention Using the difference of the rise time of the rotational speed of the disk by the difference in the volume density of these two fields, even if an appearance

configuration is the same as that of a standard disk, it aims at offering the check equipment of the optical disk which checks an inaccurate copy disk.

MEANS

[Means for Solving the Problem] this invention offers the optical disk which becomes the composition of the following (1) and (2), and its check equipment in order to solve the above-mentioned technical problem.

[0010] (1) The optical disk 1 (protection disks 1a and 1b) characterized by having the volume density of data area a which has the same AUW and the same radius as a standard disk (CD (CD-DA), CD-ROM whose diameter is 12cm) with same volume density of data area a and volume density of non-data area b, and was made into smallness from the volume density of non-data area b.

[0011] (2) the rise time to the predetermined value (rotational speed e) of disk rotational speed -- measurement (with timer) -- carrying out -- the rise time -- size -- a case (a threshold th2 -- size -- a case) a standard disk (CD (CD-DA) whose diameter is 12cm --) with same volume density of data area a and volume density of non-data area b it is CD-ROM or is an inaccurate copy disk about the 1st disk which obtained by carrying out an unjust copy -- judging -- the rise time -- smallness -- to a case (a threshold th1 -- smallness -- a case) The same AUW and the same radius as a standard disk Having had a judgment means (control circuit) 2 to judge that the 2nd disk (an optical disk 1, protection disks 1a and 1b) equipped with the volume density of data area a which has and was made into smallness from the volume density of non-data area b is a regular disk at least The check equipments A and B of the optical disk by which it is characterized.

OPERATION

[Function] Since the rise time of rotational speed serves as [the direction of an inaccurate copy disk] smallness even if the optical disk of this invention is the same as a disk with a regular appearance configuration when the rise time of the rotational speed of the disk by the difference in the volume density of these two fields is compared, since it is equipped with the volume density of the data area which has the same AUW and the same radius as a standard disk with same volume density of a data area and volume density of a non-data area, and was made into smallness from the volume density of an It can judge that it is a regular disk by distinguishing the difference in this rise time.

EXAMPLE

[Example] Hereafter, the optical disk and its check equipment of this invention are explained along with drawing 1 - drawing 5 . Drawing in which drawing in which drawing 1 shows the volume density property of the optical disk of this invention, drawing 2 , and drawing 3 show the 1st of the check equipment of the optical disk of this invention and the 2nd example block diagram, and drawing 4 shows the start property of the rotational speed of a disk, and drawing 5 are the flow charts explaining operation of the check equipment of the optical disk of this invention.

[0014] While having the same appearance configuration and same AUW as an outline (CD-DA, CD-ROM, etc. are hereafter described as a "standard disk"), for example, CD whose diameter is 12cm so that it may mention later, when the inner circumference side is heavier than a periphery side and rotates this, since moment of inertia (inertia) is small, the optical disk of this invention has the start of rotational speed quicker than standard CD disk.

[0015] (Example 1) As the optical disk 1 of a correspondence this invention is shown in invention according to claim 1 at drawing 1 (A), an appearance configuration and AUW are the same as that of a standard disk, and consist of non-data area b which is data area a and the inner circumference portion which are the periphery portion, an outermost periphery field c, and a pin center,large hole d. o is the medial axis of an optical disk 1.

[0016] Data area a begins TOC in the most-inner-circumference side, and a lot of various data are spiral as a center, or the field currently recorded in the shape of a concentric circle about a medial axis o as many pit trains. Non-data area b is a field where data are not recorded at all.

[0017] The optical disk 1 of composition of having described above has the same AUW and the same radius as a standard disk with same volume density of data area a and volume density of non-data area b, and is equipped with the volume density of data area a made into smallness from the volume density of non-data area b.

[0018] Now, an appearance configuration and the AUW of the inaccurate copy disk which copied unjustly the optical disk 1 which is a regular disk are completely the same as that of a standard disk (it is difficult to distinguish both visually). Moreover, the inaccurate copy disk has copied inaccurate data to CD-MO with same standard disk, appearance configuration, and AUW. For this reason, an inaccurate copy disk becomes what has the same volume density of data area a and the same volume density of non-data area b like a standard disk (volume density property of the solid line shown in drawing 1 (B)). On the other hand, to the radius, the optical disk 1 which is a regular disk does not have fixed volume density, and is equipped with the volume density of data area a made into smallness from the volume density of non-data area b.

[0019] The volume density in the data area a of protection disk 1a for copy preventive measures which is an example of the optical disk 1 which is a detailed regular disk is fixed to radial, it is smallness, and the volume density in the non-data area b is more fixed than the volume density of the standard disc data field a to radial, and it is size from the volume density of non-data area b of a standard disk (volume density property of the dashed line shown in drawing 1 (B)). Moreover, protection disk 1b of the volume density in the data area a which is another example of an optical disk 1 is fixed to radial, and size from the volume density in data area [of protection disk 1a described above from the

volume density of the standard disc data field a although it was smallness] a. Moreover, it goes up in the shape of a straight line, and the volume density in the most inner circumference serves as the maximum as the volume density in the non-data area b goes to an inner circumference side from a periphery side (the volume density of the outermost periphery of non-data area b is smallness from it of a standard disk). And although it is size, the volume density of the most inner circumference of non-data area b is the same as that of it of protection disk 1a which is smallness and was described above rather than that of a standard disk than that of said protection disk 1a (volume density property of the alternate long and short dash line shown in drawing 1 (B)).

[0020] The addition area which was shown in drawing 1 (B) and which applied the area (namely, volume density x radius distance) of data area a and the area of non-data area b in each volume density property of a standard disk, a copy disk, and the PUROTO disks 1a and 1b corresponds to the AUW of a disk (except for the outermost periphery field c). and each addition area of these standard disk and the protection disks 1a and 1b -- abbreviation -- the same (namely, AUW of a disk) Here, there is specification of IEC908 (the so-called Red Book specification) or JISX6281 grade in a standard disk, and the AUW of a disk is specified in this specification. Of course, if it is this contractor, it can perform easily processing it so that it may consider as the volume density property which described above the AUW of the above-mentioned optical disk 1 containing the protection disks 1a and 1b based on the AUW of a standard disk.

[0021] As mentioned above, the volume density of non-data area b is size as compared with the volume density of the data area a, and the moment of inertia of the optical disk 1 containing the protection disks 1a and 1b which the weight is concentrating on inner circumference is smallness from the moment of inertia of the standard disk which each volume density of data area a and non-data area b is the same, and the weight is not concentrating on inner circumference. By transposing the difference in this moment of inertia to the difference in the rise time of disk rotational speed, the check equipments A and B explained below perform the judgment (check) with a regular disk and an inaccurate copy disk.

[0022] (Example 2) The check equipment A of the optical disk of this invention which performs the check of correspondence now the optical disk 1 which is a regular disk, and an inaccurate copy disk to invention according to claim 2 is an object for disks dealing with a constant linear velocity (CLV), and as shown in drawing 2 , it consists of a control circuit 2, the RF digital disposal circuit 3, RF amplifier 4, an optical pickup 5, a constant linear velocity (CLV) servo processing circuit 6, a motor driver 7, and a spindle motor 8. The inside of drawing and AA are an inspected disk. The control circuit 2 was equipped with the timer which consisted of software, and the RF digital disposal circuit 3 is equipped with PLL3A.

[0023] Operation of the check equipment A of the optical disk of composition of having described above is explained. Namely, if the inspected disk AA of CLV is set on the turntable which check equipment A does not illustrate as shown in drawing 5 , the control circuit 2 which controls operation of the whole equipment and which is a microprocessor, for example will detect this, and will once change the timer of internal organs into a clearance (reset) state (100,110). Then, while a control circuit 2 sends out a disk rotation start control signal to the CLV servo processing circuit 6 according to a user choosing check operation (play operation), a timer is changed into a start state. The CLV servo

processing circuit 6 sends out the motorised signal for carrying out the rotation drive of the spindle motor 8 of a rotation idle state according to this to the motor driver 7, if a disk rotation start control signal is received. The motor driver 7 supplies the driving signal which amplified this motorised signal to a spindle motor 8.

[0024] The CLV servo processing circuit 6 detects the rotation operating state of a spindle motor 8 as follows. That is, TOC of the inspected disk AA set on the turntable rotated by the spindle motor 8 is traced by the optical pickup 5, and RF signal which this acquired is supplied to PLL circuit 3A which constitutes the RF digital disposal circuit 3 through RF amplifier 4. If the frequency of RF signal supplied from RF amplifier 4 becomes the same as that of the predetermined oscillation frequency of PLL circuit 3A and PLL circuit 3A will be in a lock state, a frequency lock signal will be outputted to the CLV servo processing circuit 6 and a control circuit 2 from PLL circuit 3A. The timer of a control circuit 2 stops a count at the time when the frequency lock signal supplied from PLL circuit 3A was supplied (it is a time of rotation of a spindle motor 8 reaching the rotational speed e shown in drawing 4 which this state mentions later).

[0025] In this way, if a spindle motor 8 raises a rotational frequency gradually from a rotation idle state and results in predetermined rotational speed, the CLV servo processing circuit 6 will lock rotation of a spindle motor 8, and it will continue (120,130) outputting a fixed motorised signal to the motor driver 7 so that the inspected disk AA may always be rotated in the state of CLV. If the predetermined CLV state of a spindle motor 8 is detected, temporary memory of the control circuit 2 will be carried out to the memory which does not illustrate the counted value of the timer at that time (140). the memory which is not illustrated -- ** -- the counted value (** value) th1 for distinguishing CD with a diameter of 8cm which are the optical disk 1 which is a regular disk, and a regular disk, and ** -- memory of the counted value (** value) th2 for distinguishing the optical disk 1 and standard disk (an inaccurate copy disk being included) which are a regular disk is carried out beforehand

[0026] A control circuit 2 reads the counted value according to ** value th 2, and the counted value of the inspected disk AA from memory, and the counted value of the inspected disk AA compares whether it is size from ** value th 2 (150). Consequently, if it is not size, the counted value of the inspected disk AA compares whether it is smallness from ** value th 1 (160). Consequently, if it is not smallness, it will be distinguished from the optical disk 1 which is a regular disk (170). On the other hand, the counted value of the inspected disk AA is distinguished from ** value th 1 with 8cmCD as it is smallness (180).

[0027] On the other hand, as for a control circuit 2, the counted value of the inspected disk AA distinguishes whether it is it that it is size from ** value th 2 a digital audio disc (CD-DA) of the standard disks further (150,190). Consequently, it is reproduced in digital audio mode that it is CD-DA (200). On the other hand, the disk concerned is discharged after being judged [be / CD-ROM (CD-MO) which is an inaccurate copy disk / it] with an inaccurate copy disk (210,220).

[0028] In this way, the check equipment A of the optical disk of composition of having described above can be discharged out of equipment, without reproducing this, when the inspected disk AA can be distinguished on 8cmCD, a regular disk (optical disk 1), CD-DA, or an inaccurate copy disk and is distinguished from an inaccurate copy disk.

[0029] By the way, the ** values th1 and th2 mentioned above are set up as follows. That

is, its attention is paid to the difference of the rise time of the rotational speed of a disk until it reaches the fixed rotational speed (for example, CLV state) e when setting the inspected disk AA in the above-mentioned check equipment A, and rotating it as shown in drawing 4 . The rotational speed of a disk expresses time until a CLV servo locks in the rotational speed which can read TOC of the most inner circumference of the disc data field a. Since the moment of inertia of the disk which carried out the usual unjust copy is size from it of the optical disk 1 which is a regular disk, the rotation rise time is Time tc. On the other hand, since the moment of inertia of an optical disk 1 is smallness from it, the rotation rise time is Time tb (tb<tc). Moreover, since it is moment-of-inertia smallness, the rotation rise time turns into Time ta from which thing of CD usual in 8cmCD, the disk (CD-ROM, CD-MO) which carried out the unjust copy, and an optical disk 1 (ta<tb<tc).

[0030] Then, ** value th 2 is the time set up so that (CD-ROM, CD-DA) (a regular disk, 8cmCD) could be distinguished. Above-mentioned ** value th 2 is the value (time) set up so that (CD-ROM, CD-DA) could be classified as it is more than this. Moreover, above-mentioned ** value th 1 is the value (time) set up so that (a regular disk and 8cmCD) could be classified as it is less than [this].

[0031] (Example 3) The check equipment B of the optical disk of this invention which performs the check of correspondence now the optical disk 1 which is a regular disk, and an inaccurate copy disk to invention according to claim 2 is an object for disks dealing with a constant angular velocity (CAV), and as shown in drawing 3 , it consists of a control circuit 2, an optical pickup 5, the motor driver 7, a spindle motor 8, FG amplifier 9, and a FG servo processing circuit 10. The same component as what was mentioned above attaches the same sign, and omits the explanation.

[0032] Operation of the check equipment B of the optical disk of composition of having described above is explained. That is, if the inspected disk AB of CAV is set on the turntable which check equipment A does not illustrate as shown in drawing 5 , a control circuit 2 will detect this and will once carry out the clearance (reset) state of the timer of internal organs (100,110). Then, while a control circuit 2 sends out a disk rotation start control signal to FG servo processing circuit 10 according to a user choosing check (play) operation, a timer is changed into a start state. FG servo processing circuit 10 sends out the motorised signal for carrying out the rotation drive of the spindle motor 8 of a rotation idle state according to this to the motor driver 7, if a disk rotation start control signal is received. The motor driver 7 supplies the driving signal which amplified this motorised signal to a spindle motor 8.

[0033] FG which does not illustrate the rotational frequency of a spindle motor 8 detects FG servo processing circuit 10, the predetermined rotational frequency signal (namely, rotational frequency signal corresponding to rotational speed e) by which memory was carried out to the rotational frequency signal inputted through the FG amplifier 9 is compared, and the time when both differential signal is no longer outputted is judged to be the predetermined CAV state of a spindle motor 8.

[0034] In this way, if a spindle motor 8 raises a rotational frequency gradually from a rotation idle state and results in predetermined rotational speed, FG servo processing circuit 10 will lock rotation of a spindle motor 8, and it will continue (120,130) outputting a fixed motorised signal to the motor driver 7 so that the inspected disk AB may always be rotated in the state of CAV. If the predetermined CAV state of a spindle

motor 8 is detected, temporary memory of the control circuit 2 will be carried out to the memory which does not illustrate the counted value of the timer at that time (140). the memory which is not illustrated -- ** -- the counted value (** value) th1 for distinguishing CD with a diameter of 8cm which are the optical disk 1 which is a regular disk, and a regular disk, and ** -- memory of the counted value (** value) th2 for distinguishing the optical disk 1 and standard disk (an inaccurate copy disk being included) which are a regular disk is carried out beforehand

[0035] A control circuit 2 reads the counted value according to ** value th 2, and the counted value of the inspected disk AB from memory, and the counted value of the inspected disk AB compares whether it is size from ** value th 2 (150). Consequently, if it is not size, the counted value of the inspected disk AB compares whether it is smallness from ** value th 1 (160). Consequently, if it is not smallness, it will be distinguished from the optical disk 1 which is a regular disk (170). On the other hand, the counted value of the inspected disk AB is distinguished from ** value th 1 with 8cmCD as it is smallness (180).

[0036] On the other hand, as for a control circuit 2, the counted value of the inspected disk AB distinguishes whether it is it that it is size from ** value th 2 a digital audio disc (CD-DA) of the standard disks further (150,190). Consequently, it is reproduced in digital audio mode that it is CD-DA (200). On the other hand, the disk concerned is discharged after being judged [be / CD-ROM (CD-MO) which is an inaccurate copy disk / it] with an inaccurate copy disk (210,220).

[0037] In this way, the check equipment B of the optical disk of composition of having described above can be discharged out of equipment, without reproducing this, when the inspected disk AB can be distinguished on 8cmCD, a regular disk (optical disk 1), CD-DA, or an inaccurate copy disk and is distinguished from an inaccurate copy disk.

[0038] Although the check equipments A and B mentioned above were explained as an isolated system on account of explanation here, it cannot be overemphasized that it can constitute even if it adds the composition of such check equipments A and B to the preceding paragraph of the reversion system of a general optical disk player or shares a part of composition of a reversion system.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the volume density property of the optical disk of this invention.

[Drawing 2] It is the 1st example block diagram of the check equipment of the optical disk of this invention.

[Drawing 3] It is the 2nd example block diagram of the check equipment of the optical disk of this invention. It comes out.

[Drawing 4] It is drawing showing the start property of the rotational speed of a disk.

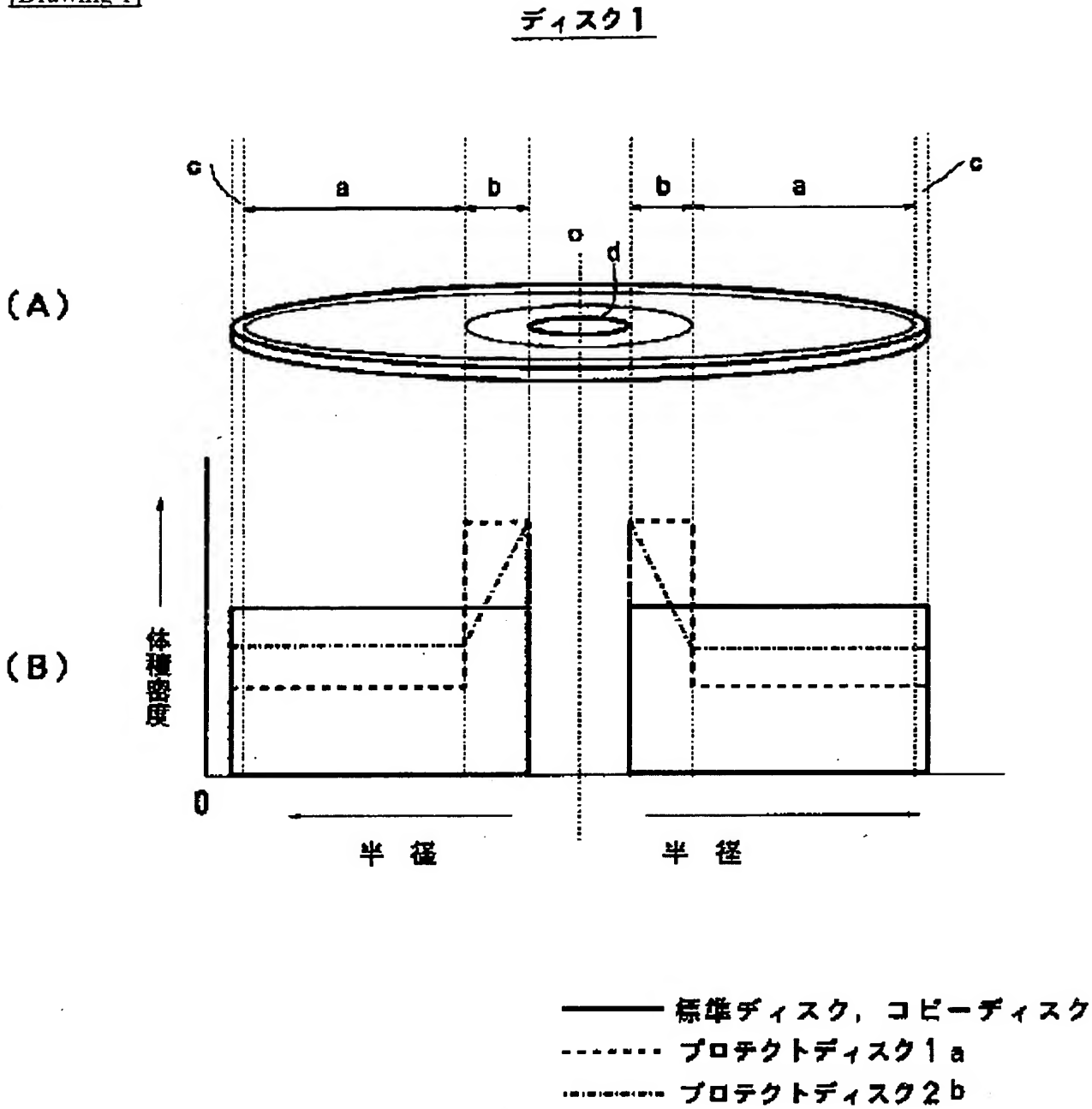
[Drawing 5] It is a flow chart explaining operation of the check equipment of the optical disk of this invention.

[Description of Notations]

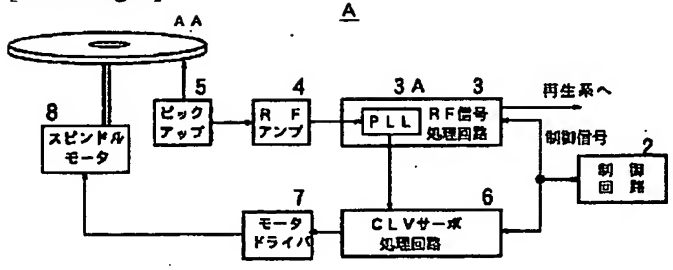
1 Optical Disk
1a, 1b Protection disk
2 Control Circuit (Judgment Means)
A, B Check equipment
Data area
b A non-data area
e Rotational speed
th1, th2 Threshold

DRAWINGS

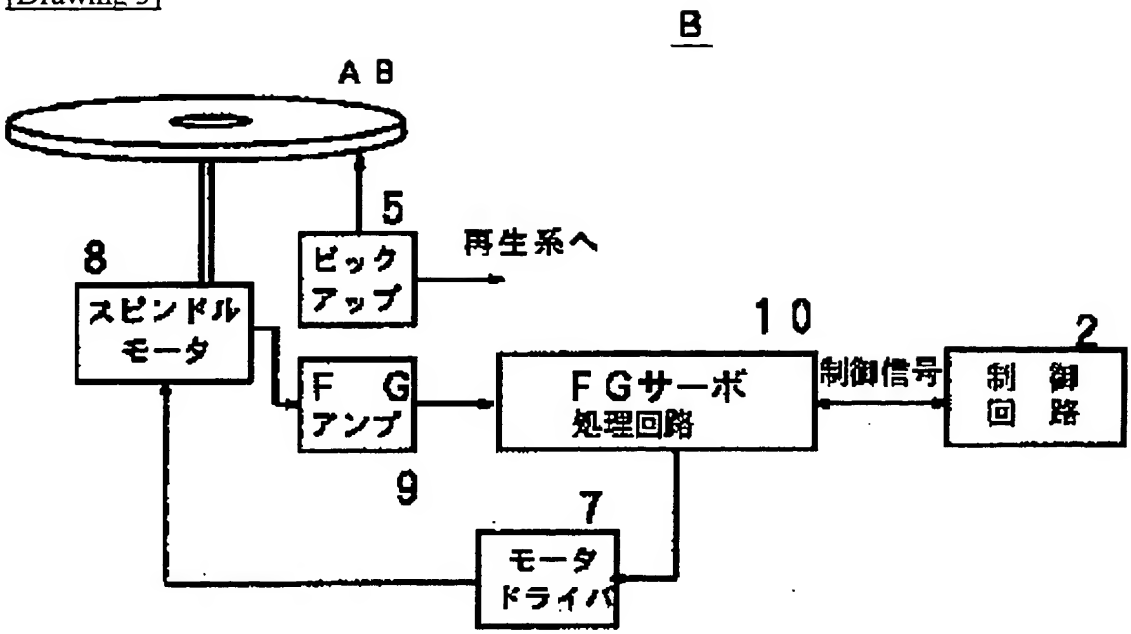
[Drawing 1]



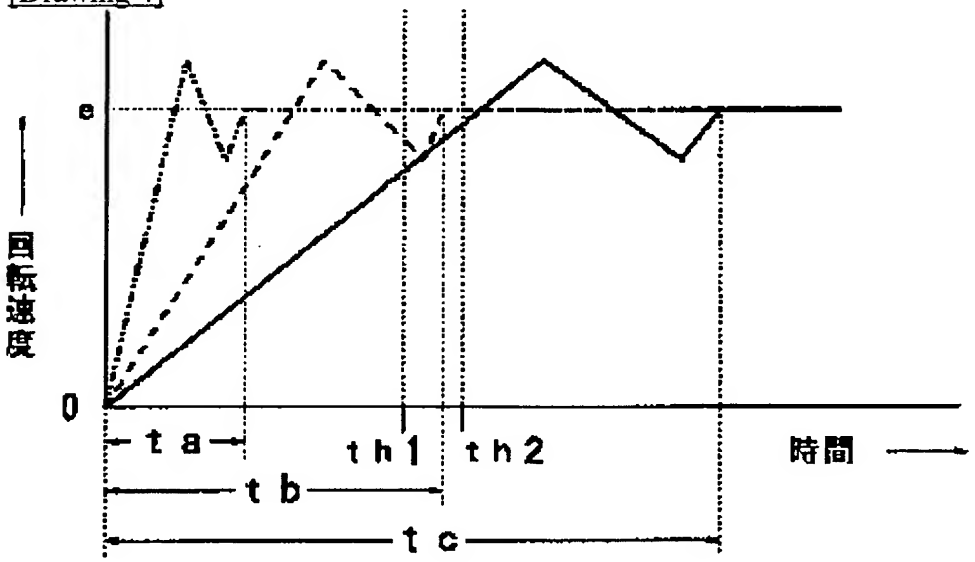
[Drawing 2]



[Drawing 3]

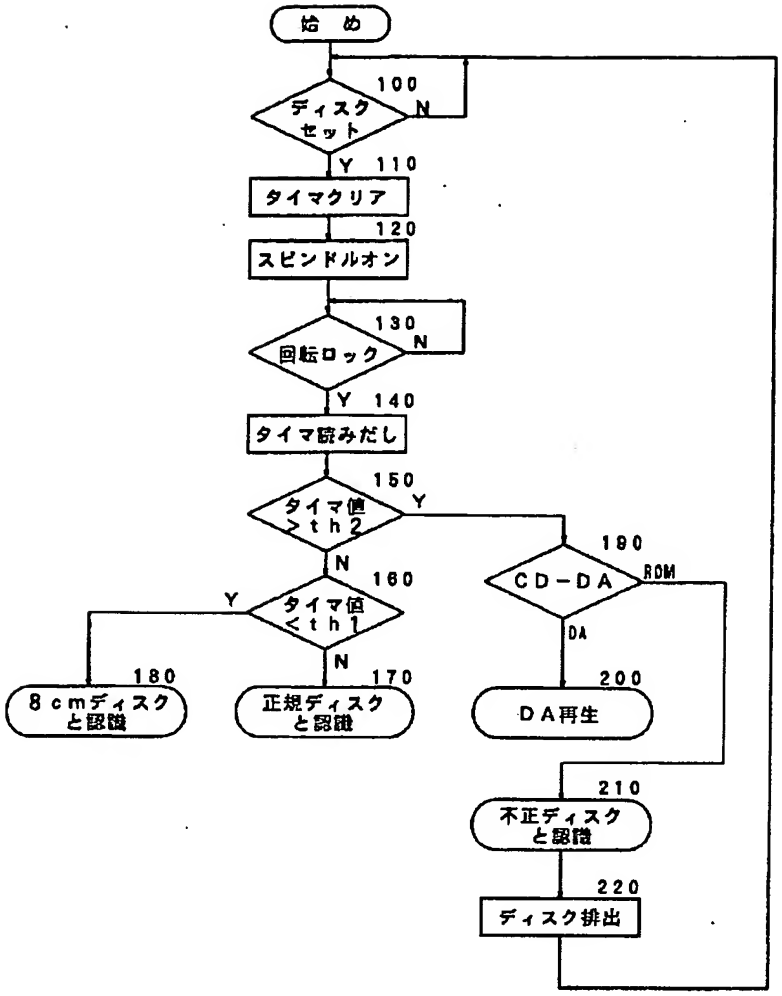


[Drawing 4]



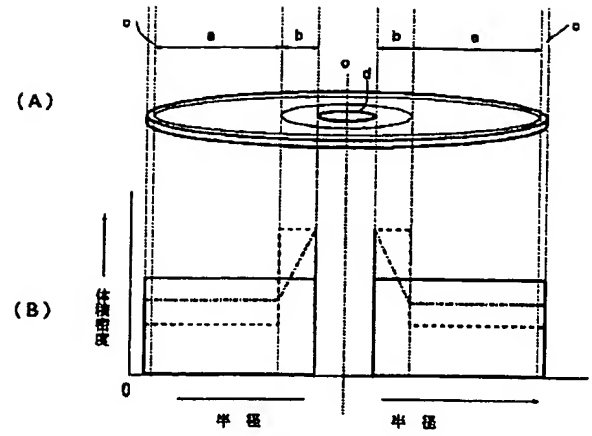
——— 標準ディスク，コピーディスク
------- プロテクトディスク1a，1b
·-·-·-·- 8cm CD

[Drawing 5]



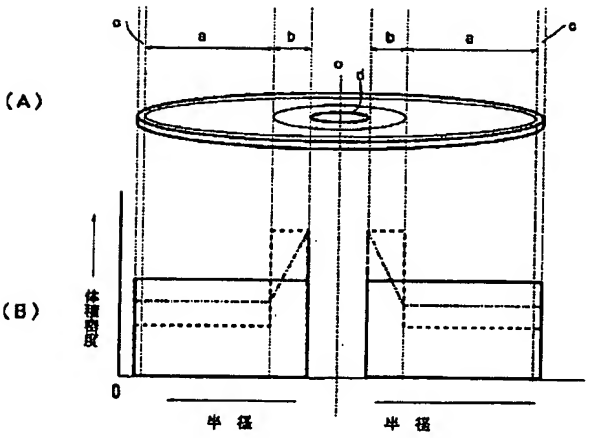
[Translation done.]

ディスク1



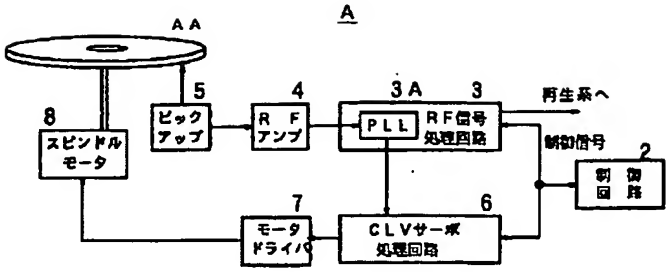
標準ディスク，コピーディスク
プロテクトディスク1a
プロテクトディスク2b

ディスク1

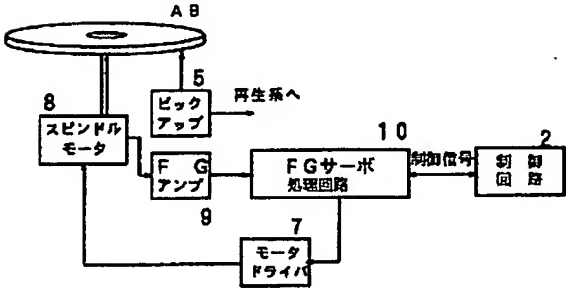


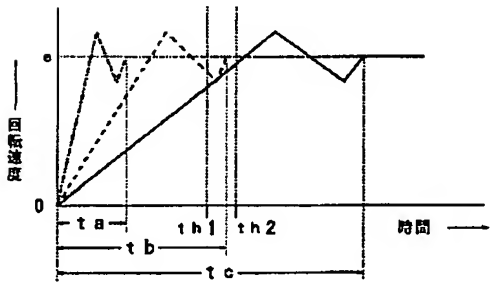
標準ディスク，コピーディスク
プロテクトディスク1a
プロテクトディスク2b

A

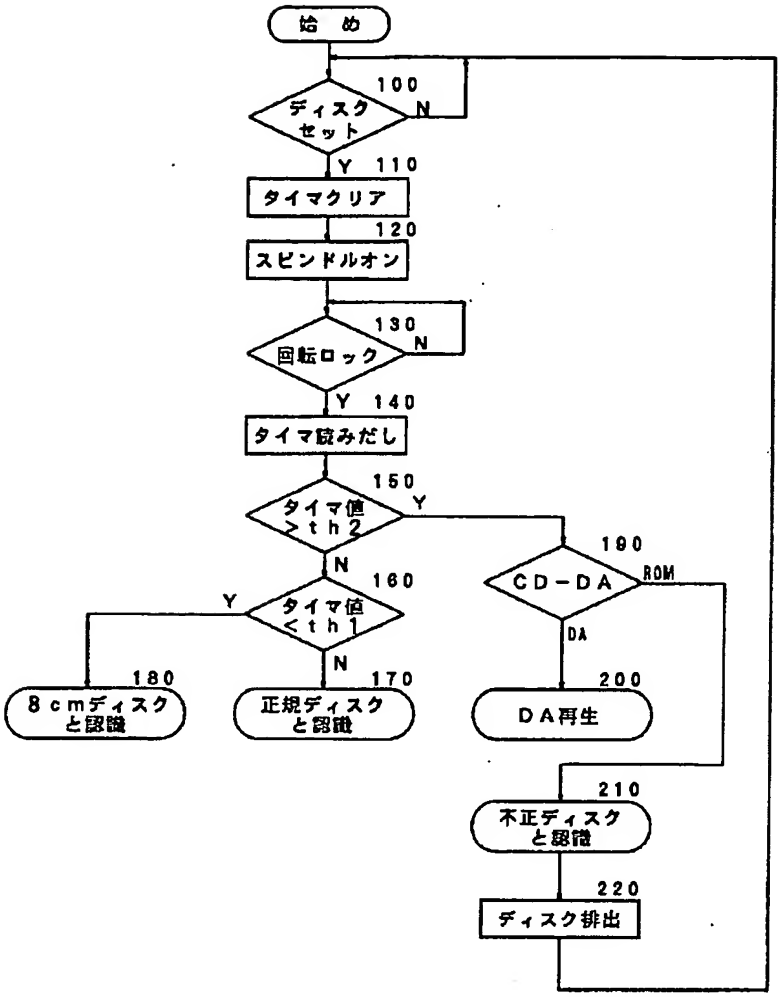


B





——— 標準ディスク，コピーディスク
------- プロテクトディスク1a，1b
-·-·-·- 8cm CD


始 め
100
ディスク セット
N
Y
110
タイマクリア
120
スピンドルオン
130
回転ロック
N
Y
140
タイマ読みだし
150
タイマ値 > t h 2
Y
N
160
タイマ値 < t h 1
Y
N
180
8 cmディスク と認識
170
正規ディスク と認識
190
CD－DA
ROM
DA
200
DA再生
210
不正ディスク と認識
220
ディスク排出